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Ch. 9- The Universe Summary

* The Sun
  + - one of the billions of stars in the universe
    - 300,000 times closer to Earth than the next closest star
    - considered an average size star
    - located 93 million miles from the Earth
    - much larger than Earth and contains 99% of the mass of our entire solar system
    - diameter at the sun’s equator is 860,000 miles (this is 109 times larger than the Earth’s diameter)
    - If the Sun was a hollow ball, it could hold more than a million Earths.
    - gives off a vast amount of energy, including light energy and solar wind
    - The Sun’s energy comes from a series of nuclear reactions taking place inside of the Sun.
    - Nuclear reactions cause the Sun to be very hot. The surface temperature of the Sun is about 10,800 degrees Fahrenheit. The temperature in the center of the Sun is 27 million degrees Fahrenheit.
    - Not solid like the Earth!- The Sun is made up of many layers of very hot gases.
    - solar flare- tremendous explosion on the surface of the atmosphere of the sun
    - A solar flare may cover an area of 391 million square miles and can shoot up as high as 300,000 miles.
    - During the flare’s 5 minute life, it can release as much energy as 10 million hydrogen bombs.
    - Solar storms occur near sunspots on the Sun’s surface.
    - Sunspots look darker because they are cooler than the surrounding gases.
    - Sunspots usually appear in 11 year cycles. (They reach their greatest number every 11 years.)
    - These magnetic storms send out particles called solar wind that affect the Earth.
    - When these particles strike the Earth’s atmosphere, they interfere with radio, television, and telecommunication signals.
    - The particles also strike the lower thermosphere which causes “The Northern Lights or Aurora Borealis in the North Pole and “The Southern Lights” or Aurora Australis in the South Pole.
    - Extreme ultraviolet radiation is emitted by stars and planetary objects from within and outside of our solar system.
    - Stars have a life span.
    - Evidence indicates that matter, energy, space, and time began with a violent explosion called the Big Bang 10-15 billion years ago.
    - It is thought that the Sun has been producing light for 5 billion years and is expected to burn for 10 billion years.
* The Solar System
* The Solar System is a group of bodies called satellites, or planets, orbiting the sun.
* A satellite is anything that orbits around something else.
* In 2006, Pluto was demoted from planet to “dwarf planet.”
* Billions of fast moving rocks called asteroids also orbit the sun.
* The difference between an asteroid and a meteoroid is size only. (Asteroids are larger.)
* Planets are not stars.
* Planets shine because they reflect the Sun’s light.
* Johann Kepler was the first person to conclude that planets orbit the Sun. (This occurred in 1605.)
* Planets revolve in a counterclockwise elliptical path around the Sun.
* The time needed for a planet to make a complete revolution around the Sun is called the planet’s year.
* Planets rotate, like tops, around their axis while revolving around the Sun.
* The time it takes for the planet to rotate once around its axis is called the planet’s day.
* In the Solar System there are at least 94 moons. (Earth has 1, Mars has 2, Jupiter has 39, Saturn has 22, Uranus has 21, Neptune has 8, and Pluto has 1.)
* Newton’s First Law of Motion and Newton’s Law of Gravitation explain how the planets keep their orbits.
* Mercury
* Nearest to the Sun (36 million miles from the Sun)
* Revolves around the Sun once every 88 days
* Mercury is heavily cratered and has no atmosphere or water.
* Mercury’s diameter is around 3,000 miles.
* The side of Mercury that faces the Sun is 872 degrees Fahrenheit and the side that faces away from the Sun is -300 degrees Fahrenheit.
* Venus
* 67 million miles from the Sun
* Revolves around the Sun once every 224.7 days
* Rotates around axis once every 243 days (Yes, Venus’s day is longer than its year!)
* Diameter is 7,500 miles
* The sunlit side of Venus is 900 degrees Fahrenheit, while the dark side is 360 degrees Fahrenheit.
* Strong winds transfer heat from the sunlit side to the dark side of Venus.
* There are no seasons on Venus.
* Barometric pressure is 100 times what Earth’s is
* Evidence shows possible volcanic activity on Venus which may explain the cloud cover.
* Earth
* 93 million miles from the Sun
* Diameter is 7,300 miles
* Rotates on axis every 24 hours
* Only planet where water is found at the liquid state
* Earth is biologically active. (Think people and animals!)
* Average temperature is 59 degrees Fahrenheit
* Mars
* 141 million miles from the Sun
* Diameter is 4,160 miles (about ½ of Earth’s diameter)
* On Mars, you’d weigh 1/3 what you do on Earth.
* Mars rotates on its axis once every 24.5 hours.
* Rotates around the Sun once every 687 days
* Average temperature is -258 degrees Fahrenheit
* Mars has seasons.
* Mars’s atmosphere is much thinner than Earth’s.
* Mars has the largest known volcano is the Solar System. The volcano is the size of Texas and 3 times taller than Mount Everest.
* Asteroid Belt
* Made up of thousands of bodies that circle the sun between Mars and Jupiter
* The asteroid called Ida is 31 miles across and has a moon.
* There are only a few asteroids larger than 100 miles in diameter.
* The largest asteroid is called Ceres and is 588 miles in diameter. (about ¼ the size of our moon)
* Jupiter
* 484 million miles from the Sun
* Revolves around the Sun once every 11.86 years
* Largest planet with a diameter of 89,000 miles
* Rotates on its axis once every 10 hours. (Short day!)
* Jupiter’s largest moon is Ganymede. It is larger than Pluto and Mercury.
* Jupiter is a giant ball of gas. 90% hydrogen and 10% helium
* Jupiter has a large red spot that is thought to be like a hurricane. It has persisted for hundreds of years.
* Jupiter has 3 thin rings.
* Saturn
* 890 million miles from the Sun
* Revolves around the Sun once every 29.5 years
* Diameter is 75,000 miles
* Rotates on its axis once every 10 hours. (Short day!)
* Surrounded by 7 broad rings that are made up of ice and rock.
* Uranus
* 1,800 million miles from the Sun
* Revolves around the Sun once every 84 years
* Diameter is 31,000 miles
* Rotates on its axis once every 17 hours
* Uranus rotates on an almost horizontal axis. The other planets are on a vertical axis.
* Uranus has 11 faint and narrow rings.
* Neptune
* 2,800 million miles from the Sun
* Revolves around the Sun once every 164.8 years
* Diameter of 30,000 miles
* Rotates on axis once every 18 hours
* 4 rings: 2 are narrow and the other 2 are narrow
* Pluto
* Now considered a “dwarf planet” because of its small size
* Diameter is 1,400 miles which is smaller than Earth’s moon
* 3,700 million miles from the Sun
* Neptune and Pluto’s elliptical paths cross so Pluto is not always the farthest from the Sun.
* Rotates on its axis once every 6 days
* Comets
* revolve around the Sun
* Comets cut across the planets’ orbits.
* Comets have a head and when they get near the Sun, they have a tail also.
* Comets reflect the light of the Sun.
* The tail of the comet always points away from the Sun.
* Halley’s Comet returns to our sight once every 76 years.
* Some comets never return to our sight.
* The way comets form is unknown.
* Meteor and Meteorite
* A meteor is a sudden brief streak of light in the night sky that is caused by friction between air molecules in Earth’s atmosphere and an incoming piece of matter (asteroid, comet, or meteorite).
* They travel at 100,000 MPH.
* Meteors are often referred to as “Shooting Stars.”
* Some meteor showers occur annually.
* Meteorites are meteors that strike the Earth.
* The Sun Causes the Seasons on Earth
* Earth’s axis is tilted at an angle of 23.5 degrees and is always pointed towards the North Star.
* When the Northern Hemisphere is tilted towards the sun, they have summer.
* Summer Solstice occurs on June 21.
* During the summer, the Sun’s rays are shining directly on the Northern Hemisphere.
* The Northern Hemisphere gets more daylight than darkness during the summer.
* During summer in the Northern Hemisphere, the North Pole has daylight all 24 hours.
* Winter begins on December 22 which is called Winter Solstice.
* During this time, the Sun’s rays shine at a slant. The weaker, slanted rays cover more of Earth’s surface causing one spot not to be heated as much.

**End of Adeana Reeves Section of summary**

* The Earth’s Moon
* Earth’s moon is a large ball of rocky material that revolves around the Earth.
* It is about 2,160 miles in diameter which is ¼ the size of Earth.
* The Earth’s moon has gravity pull of 1/6th of what is on Earth.
* Moon has no atmosphere, meaning there is no wind or sound on the moon.
* There is water on the moon.
* The temperature of the moon can be as high as 220 degrees F during the day and as cold as negative 294 degrees F at night.
* Surface of the moon is dark flat areas, mountain ranges and craters. The moon is covered with layers of dust particles, pebbles, stones and a version of soil called regolith.
* Motion of the moon around Earth
* The moon revolves around the Earth in a counterclockwise direction.
* The point that the moon is closest to the Earth is called perigee and when it is the farthest it is called apogee.
* The moons average distance from Earth is 220,000 miles when it is closest to Earth and 250,000 when it is farthest.
* Conditions that keep the moon rotating is the pull of gravity and inertia.
* The moon revolves around the earth at a speed of 2,200 miles per hour and takes 27.3 days to make on complete orbit around Earth. This is called a lunar month.
* Phases of the moon
* The moon doesn’t give off light but reflects off the sun.
* The phases of the moon is the changes in lighted area of the moon
* During full moon, the moon is lighted and called waxing. During the time of full moon to new moon the lighted area is less and is called waning.
* The rise and fall if Earth’s oceans
* Tides are the rise and fall of the oceans on earth due to the moon’s gravitational pull.
* The tides are called high tide, flood tide, low tide, spring tide, neap tide and direct tide.
* When the sun and moon are in line with Earth, the gravitational pull is much stronger causing very high and low tides.
* Eclipses
* As the sun shines on Earth and the moon, it throws a shadow into space that is about 866,000 miles for Earth and 240,000 for the moon.
* Night on Earth is because we are in that shadow.
* When the moon passes between Earth and the sun, we cannot see the sun and this is called a solar eclipse. This only happens when the new moon and is between the earth and the sun and the moons shadow falls on earth.
* When the sun light is completely blocked off, it is called a total eclipse.
* When the sun light is only partially blocked off it is called a partial eclipse.
* When the Earth passes between the sun and the moon, the Earth blocks the sunlight that the moon reflects and the moon cannot be seen. This is called a lunar eclipse.
* An eclipse of the moon only occurs when there is a full moon and the earth is between the moon and sun, causing earth’s shadow to fall on the moon.
* Beyond the solar system
* How is the universe studied?
* The oldest instruments were the optical telescope.
* There are two categories of optical telescopes, the refracting that uses lens to focus the incoming light and reflecting that uses a lens that are curved mirror to gather and concentrate the incoming beam of light. Both have been around since the days of Galileo in the early 1600’s.
* Now astronomers use more modern optical telescopes that are larger and more powerful.
* Astronomers believe that galaxy collisions today are lesson common than they were billions of years ago.
* Radio telescope is able to study distant objects by detecting radio waves given off the objects.
* A radio telescope is located in West Virginia and is about 600 ft across.
* Infrared telescopes can penetrate dusty regions of interstellar space.
* High energy telescopes study the universe as x-ray and gamma rays.
* A light year is the time and distance light to travel in one year. A megaparsec is the distance light travels in 3.26 years.
* The Stars
* Stars are suns in space. They produce their own light.
* Although there are countless stars in the sky about 3000 are visible to the naked eye.
* Stars vary in size. Small stars are called dwarfs, large stars are called giants and the tremendously large stars are called super giants.
* Stars will vary in color according to their age and temperature.
* Young stars are blue white or white. Oldest stars are red.
* The stars brightness depends on the stars temperature, size and distance from earth.
* Double stars also called binary stars are two stars that are held closely together by their pull of gravity on each other.
* Variable stars grow bright in flares then dim again. This happens because the star exploded, or when the star grows and then shrinks.
* A star cluster is a group of stars held together by their gravitational pull on one another. Open clusters are made a few stars moving in parallel paths, where as a globular cluster are shaped like a ball or globe and may contain 10,000 stars.
* Pulsars are the dense remnants of collapsed stars. Pulsars have a strong magnetic field.
* Black holes first discovered in 1972, and were believed to have a gravitational force so strong that until recently it was thought that no object or form of energy could escape it.
* Every particle of matter has a mirror opposite called antimatter that is a negatively charged electron in a positively charged position.
* Quasars are very distant objects that emit an immense amount of light.
* Constellations
* Constellations are groups of stars divided by the astronomer long ago to make it easier to describe location of given stars. Once the constellations were named after roman gods and legendary heroes but now the International Astronomical Union controls the naming.
* In the northern hemisphere the constellations move around a point called the celestial North Pole that is directly above the Earth’s North Pole. In the southern hemisphere all constellations move around a point that is called celestial South Pole that is directly above Earth’s South Pole.
* The North Star, called Polaris has been historically been a signpost for navigators. The North Star is located at the bottom of the little dipper.
* Galaxies
* A galaxy is a large collection of stars, dust neutron stars, black holes and gas all held together by the pull of its own gravity.
* There are millions of galaxies beyond our own. Our galaxy that we live is called the Milky Way.
* There are at least a billion stars in the galaxy that can be seen as a broad band of light stretching across the sky. The galaxy forms a spiral shape that is somewhat like a flattened wheel.
* The distance of the galaxy is 100,000 light years. The entire galaxy is rotating at a tremendous speed.
* Irregular galaxies have many blue white stars in them and probably young galaxies. Spiral galaxies have blue and white outer stars and red stars in the center. Elliptical galaxies are shaped like an oval are smaller.
* The expanding universe and Hubble’s Law
* Space is at least 10 billion light years across. Most galaxies are separated from their neighbors by a million light years of space. Evidence shows that galaxies are moving away from each other at increasing speed.
* Edwin Hubble in 1929 discovered that galaxies are receding from us at a speed that is proportional to their distance.
* Some galaxies are moving through space at a speed of more than 30,000 miles per second. This means that space is expanding but the galaxies are remaining the same.
* Space Exploration
* NASA space programs (National Aeronautics and Space Administration)
* Specific satellites were all built and launched by US; carry instruments that supply information about radiation, earth’s magnetic field, Earth’s shape, temperature in space meteoroids and other conditions in the upper parts of the atmosphere and in outer space.
* Weather satellites make weather observations help scientist forecast the weather more accurately and to have better understanding of what causes weather.
* Communication satellites are used to send and reflect radio and television signals, telephotos and telephone calls to all parts of the world.
* Navigation satellites help guide aircraft and ships by submitting special radio signals.
* Lunar and interplanetary spacecraft are used to explore the moon and the planets.
* Space Station
* A large artificial satellite revolving around the Earth is a space station with many uses.
* From the space station, scientists can collect a vast amount of knowledge about the earth, its atmosphere, the weather and its fields of gravitation and magnetism.
* The space station can be used to reflect and send radio, radar, television signals all over earth.
* It can be used to launch rockets into outer space.

End of Karen Lane’s part of the summary.